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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/786,787

02/24/2004

Huikai Xie

5853-345

3761

30448

7590

03/28/2005

AKERMAN SENTERFITT

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EXAMINER

HANLEY, JOHN C

ART UNIT

PAPER NUMBER

2856

DATE MAILED: 03/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/786,787

Applicant(s)

XIE ET AL.

Examiner

John C. Hanley

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>9/7/04</u> . | 6) <input type="checkbox"/> Other: ____. |

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DETAILED ACTION

Information Disclosure Statement

1. The IDS submitted by applicant on September 7, 2004 was considered. However, in view of the references authored by some of the co-applicants cited as references in some of the IDS references, and the year 2002 thesis by co-applicant Xie entitled "Gyroscope and Micromirror Design Using Vertical-Axis CMOS-MEMS Actuation and Sensing" found by the Examiner in a copending application filed by the same applicants, and the many references cited in said thesis that would appear to predate the filing date of the present application by more than a year, the adequacy of the Information Disclosure Statement is in doubt. Therefore, in accordance with 37 C.F.R. 1.105, the Examiner is requiring the submission of a copy of any non-patent literature, published application, or patent by any of the inventors that relates to the claimed invention. The Examiner is further requiring the submission of a copy of any literature cited as a reference in any of the inventor's publication(s) that relates to the claimed invention, and/or any other relevant publication relating to the claimed invention known to the inventors.

Inventorship

2. In view of the subject matter found in the Examiner-discovered thesis of Xie cited above, and the statements regarding the contribution of the other co-inventors in the "Acknowledgements" section of the thesis, the contribution of co-inventors to the claimed invention is questioned. Applicant is requested to review the contribution of each inventor in relation to the claimed invention to confirm whether proper inventorship is claimed. As further evidence, the subject matter shown in Figure 5B of the application is shown in Figure 2 of "A Single-Crystal Silicon 3-Axis COMS-

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MEMS Accelerometer", IEEE Sensors, 2004, authored by only one of the present applicants, as well as two authors not listed as applicants.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a) because they fail to show the difference between structure having an electrode stack electrically isolated from the SCS membrane layer and structure having an electrode stack electrically connected to the SCS membrane layer as described in the specification. Figures 2C and 2D do not distinguish the structural difference over Figures 2a and 2B. Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d).

4. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the subject matter of claims 11 and 16 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

5. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "428" has been used to designate both an anchor and the side of springs in Figures 4a-4c.

6. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: no 155 or 170 in Figure 1B; no 155, 160, 175 or 185 in Figure 1D; no 720 in Figure 7A.

7. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only

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one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

9. Claim 11 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The detailed description and/or drawings fail to depict or show how to fit x-y sensing structure inside the rigid frame while providing room and operability for the z-axis accelerometer.

10. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

11. Claims 1-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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12. Regarding claim 1, the use of the term "single sensor" is unclear.

Applicant discloses a separate z-axis sensor and a separator xy-axis sensor, using a distinct proof mass for each, with no less than one sense comb for each of three axes. How is this a single sensor? Further, there are separate and distinct microstructure areas having different sensors.

13. Regarding claim 2, "communicably connected to said accelerometer" is unclear because the electronic circuit is previously recited as an element of the accelerometer, then claimed as being connected to said accelerometer as if it was a different entity. "Communicably connected" is structurally unclear as to how it communicates with any of the elements.

14. Regarding claim 4, "utilize" is structurally unclear, and further unclear as to how it further limits claim 1, since all components in claim 1 already "utilize" the membrane layer.

15. Regarding claim 8, it is unclear how the claim 7 is further limited. In claim 7, a membrane layers is an element of each comb finger set, whereas in claim 8, they are not. It is also unclear what the membrane layers are isolated from. Is it other membrane layers, or the metal layers that are already isolated via the dielectric in the metal/dielectric stack of claim 7?

16. Regarding claim 9, it is unclear how the rigid frame can structurally decouple x-y sensing from z-sensing.

17. Regarding claim 10, it is unclear what the z-axis sensing elements are. Z-sense comb fingers 540 in Figure 5A are on the proof mass, which is decoupled from the structure for x-y sensing. Thus, how can the z-axis sensors be an "effective proof mass" for x-y sensing?

18. Regarding claim 11 (which is not depicted in the drawings or adequately described in the specification), the x- and y-sensing structure is decoupled from the proof mass, so how can it be an "effective proof mass" for z-sensing

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Further, having the structure for x-y sensing inside the frame is not consistent with parent claim 9, in which the x-y sensing structure is outside of the frame. Therefore, this is an omnibus type claim.

19. Regarding claims 12 and 13, it is unclear what the structure for differential capacitive sensing senses, and how the structure is structurally related to the elements recited in claim 1.

Claim Rejections - 35 USC § 102

20. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

21. Claims 1-10 and 16-20 are rejected under 35 U.S.C. 102(a) as being anticipated by the Hukai Xie Ph.D. thesis of May 2002 (Reference W).

22. Figure 6-38 on page 194 of the thesis, taken in conjunction with the text of the thesis, clearly shows a three-axis accelerometer chip having a plurality of comb finger sets with one set for each of three orthogonal axes, where all are on a membrane layer portion of a single crystal substrate, and a proof mass support by at least one flexure, with comb fingers on the proof mass, where the flexure connects the proof mass to the membrane. A pre-amplifier is shown on-chip in Figure 6-24 on page 126. The comb finger sets provide fully differential capacitive bridges for all axes, and are formed of metal/dielectric stacks disposed on the membrane layer, where the metal may be electrically connected or isolated from the membrane layer, with the membrane layer having a smaller cross-section than the metal area of the fingers (Figure 3-20, page 51; and Figure 6-37, page 194). The structure for

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Z-axis sensing is spring decoupled from a rigid frame used for supporting comb fingers for x- and y-axis sensing. The membrane layer is further taught as being less than 100um thick on page 18.

Conclusion

23. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. (Note: the prior art publications cited by the Examiner are not provided to applicant because they are publications by one or more of the co-applicants and/or the Assignee, and are electronically available at no cost on web sites provided by applicant Xie and Carnegie Mellon University, and the University of Florida, as listed below*).

24. Most of the prior art cited generally shows CMOS process MEMS devices that show multilayer stacks of metal and dielectric for comb fingers, including lateral and/or vertical sensing, with fully differential sensing. Reference U' further teaches a 50um to 80um thick membrane layer, and no-chip preamplifier, metals stacks electrically connected and/or isolated from the membrane layer, where the membrane layer is smaller in cross-section than the stack. Reference U indicates in the introduction that interdigitated comb fingers can be used for displacement or acceleration detection in all three directions, and that integrated tri-axial accelerometers have such advantages as smaller size and less cost than the combination of three discrete single-axis accelerometers.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John C. Hanley whose telephone number is 571-272-2195. The examiner can normally be reached on M-F 9AM-5:00PM.

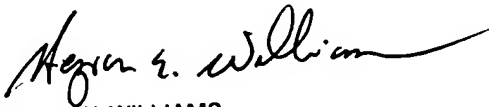
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron Williams can be reached on 571-272-2208. The

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fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JCH


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